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The Aeronautical Journal.

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NOTICES OF The Aeronautical Society.

GENERAL MEETING.

The next General Meeting of the Aeronautical Society will be held in the rooms of the Society of Arts, John Street, Adelphi, on Tuesday, July 17th. The chair will be taken, at 8 p.m., by Major H. C. Roberts. The following papers will be read :—

1. "Cloud Photography from Balloon," by the Rev. J. M. Bacon, illustrated by photographic lantern slides.
2. "Portable Electric Balloon Signalling in War," by Mr. Eric Stuart Bruce, M.A., Oxon., illustrated by lantern views, working models, and experiments.
3. "The Weczera Flying Machine," by Mr. L. W. Broadwell, with exhibition of the model of the machine, which has lately arrived from Hungary.
4. Foreign Communication.—Dr. K. Danilewsky's Flying Machine, illustrated by photographs supplied by the inventor.

During the evening some lantern views depicting Major Baden-Powell's latest kite experiments at the front will be projected on the screen.

ERIC STUART BRUCE,
Honorary Secretary, pro tem.

In reply to numerous enquiries from members of the Aeronautical Society and others concerning news of Major Baden-Powell, the Honorary Secretary (*pro tem.*) has pleasure in stating that he lately received a letter from Major Baden-Powell, which contained the welcome news that he was then "very well and fit." Though temporarily absent from the duties of the Honorary Secretaryship of the Aeronautical Society, he takes the keenest interest in the proceedings and welfare of the Society and its journal, and is a contributor to the present number.

Aeronautics at the Paris Exhibition.

1. THE AERONAUTICAL EXHIBITS.

Perhaps it may be taken as a sign of the vitality of the science of aeronautics in 1900, that one of the few exhibits to be ready amidst the chaos and utter desolation of the opening day of the Paris Exhibition of 1900 was the large Flying Machine suspended from the roof of the French Aeronautical Section. Not that much commendation can be bestowed on the particular machine exhibited, for, though its huge wings were of sensational interest to the multitude, to the expert they were suggestive as being rather an advertisement for a light motor than of probable practical utility.

The French aeronautical exhibit is mainly of historic interest, but an hour may be pleasantly spent in examining the various relics that have been collected together, and which were made so intensely interesting to the writer, who had the privilege of having them explained by so versed a balloonist as Monsieur De Fonvielle.

Amongst the exhibits particularly interesting are the paintings on dinner service plates, exhibited by M. Albert Tissandier. These are descriptive of the early balloon ascents, and include the ascent of Charles, the inventor of the gas balloon, from the gardens of the Tuilleries. This unique collection shows what an impression the early balloons made on the popular mind in France.

There are many relics of interest connected with the memorable use of balloons during the Siege of Paris, an episode in balloon history which has never been more graphically described than it was in Major Baden-Powell's lecture at the United Service Institution some years ago, and which is, without doubt, the greatest example on record of the possibilities of the free balloon. Amongst these relics is the balloon, "La Volta," by means of which M. Jansson escaped from the besieged city. Very graphically did M. Albert Tissandier describe to the writer the story of this aerial voyage. How the Germans offered M. Jansson his freedom, if he wished to leave Paris to make a scientific expedition. But M. Jansson refused their generous offer. What need of it when he had his balloon and the free air! In the car of the balloon now on view at the Exhibition, M. Jansson, of his own free will, left the French capital.

There are also on view the medals won by the balloonists who left Paris during the siege. There are also interesting relics of the fatal balloon accident by which Messieurs L'Hoste and Mangot lost their lives while endeavouring to cross the Channel, including the valve of the balloon Arago.

2. THE AERONAUTICAL COMPETITIONS.

Practical Aeronautics in 1900 is to be represented by the Balloon Competitions rather than by the exhibits in the interior of the buildings. These are to take place in the Bois de Vincennes, from the 17th June to the 30th September. (See table on page 131.)

3. THE INTERNATIONAL AERONAUTICAL CONGRESS.

The programme of the International Aeronautical Congress was published in the January number of this Journal. The dates are now announced to be from 15th to 20th September. Colonel Jekyl, the Secretary of the Royal Commission of the Paris Exhibition, has informed the Honorary Secretary of the Aeronautical Society that it is the intention of Her Majesty's Government to send a special delegate to represent Great Britain at the sittings of this important Congress. It is satisfactory that the published list of the members of the Congress include the names of some of the members of the Aeronautical Society of Great Britain. It may reasonably be expected that several other members of the Society will join in the proceedings.

Mr. Eric Stuart Bruce's Address to the Members of La Société Française de Navigation Aerienne, on "The Aeronautical Society of Great Britain and the Work of the Members of its Council."

On the occasion of Mr. Eric Stuart Bruce's recent visit to Paris in connection with his electrical signalling balloon exhibited in the Paris Exhibition, he met with a most cordial reception by La Société Française de Navigation Aerienne," being not only immediately invited by Monsieur Triboulet to attend the Council Meeting of that Society, to make the acquaintance of the President, Monsieur De Fonvielle, and other members of the council, but also being asked to address the General Meeting of the Society, on May 3rd, on the subject of "The Aeronautical Society of Great Britain, and the Work of the Members of its council, with Special Reference to the Use of the Balloons in the South African War." This address is given in full below. The promise of Monsieur De Fonvielle to come over to England to address the British Society on the subject of his scientific balloon work will, no doubt, meet with the warmest appreciation on the part of the members of our Society.

In introducing Mr. Bruce to the meeting, Monsieur De Fonvielle, the President of the meeting, said that he, like all those present, held those philosophers not to have been in error who hailed the invention of the balloon as the surest method of bringing about universal peace. Yet, so far, it was the needs of war that had stimulated balloon development. The glorious proof of this was the war balloons constructed at Meudon, and used at the end of last century, and the balloon post of the siege of Paris. It was to these two eventful successes that was owing the present aeronautical renaissance—a renaissance so active that the meetings of the French Aeronautical Society could barely cope with the new facts to be registered. We are not, there-

TABLEAU DES DATES DES CONCOURS ET DES PRIX.

DATES DES CONCOURS. (1)	NATURE DES CONCOURS. (2)	SÉRIES. (3)	1er PRIX.		2e PRIX.		3e PRIX.	
			PLAQUETTE.	PRIME.	PLAQUETTE.	PRIME.	PLAQUETTE.	PRIME.
				francs.		francs.		francs.
17 juin	Concours de durée pour ballons libres montés.....	1re série.	V.	500	A.	200	B. A.	100
24 juin	——— d'altitude pour ballons libres montés	1re série.	V.	200	A.	100	B. A.	
1er juillet	——— de ballons historiques		A.	400	B. A.	200	B.	100
	——— de montgolfières		A.	200	B. A.	100	B.	
15 juillet	——— de distance minimum par rapport à un point fixé à l'avance pour ballons libres montés	1re et 2e séries.	A.	200	B. A.	100	B.	
22 juillet	*Idem*	3e série.	A.	200	B. A.	100	B.	
29 juillet	Concours d'altitude pour ballons libres montés	2e série.	V.	200	A.	100	B. A.	
12 août	——— de plus longue distance parcourue pour ballons libres montés	1re série.	V.	500	A.	200	B. A.	100
	Concours de diagrammes.....		A.		B. A.		B.	
19 août	——— de cerfs-volants		V.	200	A.	100	B. A.	
26 août	——— de durée pour ballons libres montés	2e série.	V.	500	A.	200	B. A.	100
9 septembre	——— de plus longue distance parcourue pour ballons libres montés.....	2e série.	V.	500	A.	200	B. A.	100
	Concours de photographie en ballon dans un même concours		A.	100	B. A.	50	B.	
16 septembre ..	Concours de durée pour ballons libres montés..	3e série.	V.	500	A.	200	B. A.	100
	——— de cerfs-volants		V.	200	A.	100	B. A.	
20 septembre .. (Départ de nuit.)	——— de plus longue distance parcourue pour ballons libres montés	3e série.	V.	500	A.	200	B. A.	100
	Concours d'éclairage pour ascensions nocturnes.....		B. A.	200	B.	100	"	
23 septembre ..	——— de procédés de gonflement des ballons.....		A.	200	B. A.	100	B.	
	——— de ballons sondes.....		V.	200	A.	100	B. A.	
	——— d'altitude pour ballons libres montés	3e série.	V.	200	A.	100	B. A.	
	——— de compte rendu dans un même concours ..		B. A.		B.			
30 septembre .	——— au 2e degré, de plus longue distance parcourue pour ballons libres montés		V.	1,000	A.	500	B. A.	200
	Concours au 2e degré, de durée pour ballons libres montés		V.	1,000	A.	500	B. A.	200
Du 17 juin au 30 septembre.	——— de photographie en ballon dans l'ensemble des concours.....		A.	100	B. A.	50	B.	
	Concours de compte rendu		B. A.	"	B.	"	"	
	Grand-Prix de l'aéronautique		Or.	1,000	"	"	"	"

N.B. La 1re série de ballons libres sera composée de ballons de volumes sensiblement égaux et handicapés quant au lest.
La 2e _____ de ballons de volumes quelconques et handicapés.
La 3e _____ sans conditions de lest.
Les plaquettes sont en or ; en vermeil V. ; en argent A. ; en bronze argenté B. A. ; en bronze B.
Le Grand-Prix de l'aéronautique sera attribué à l'aéronaute qui, dans l'ensemble des épreuves de durée, d'altitude et de distance horizontale pour ballons libres montés, aura réuni la plus grande valeur de prix.

fore, surprised to find another war—the Anglo-Boer war—providing occasion for further developments in aerial navigation. Let us forget for a moment the streams of blood inundating the richest country of the ancient African Continent, and realise that notwithstanding steps towards the conquest of the air, steps of peace and humanitarianism are being made. For it cannot be in vain that the great and commercial nation to whom is due much of the progress in the industrial arts shall have been directing her engeries to aeronautics. It was with the greatest satisfaction that he informed the meeting of the presence that night of Mr. Eric Bruce, the temporary Honorary Secretary of the Aeronautical Society of Great Britain, who would now address them, informing the French Society of their colleagues across the Channel, and of what they had done for their country in the present crisis. There was no need for him, he felt, to ask the sympathetic interest of the meeting in Mr. Bruce and the Society he represented. Mr. Bruce would speak in English, and he himself would have the privilege of translating his remarks, passage by passage as delivered, into French. (Much applause.)

MESDAMES ET MESSIEURS.

I have been asked by your distinguished President, M. De Fonvielle, to address to you this evening a few words concerning the Aeronautical Society of Great Britain, and especially concernng the work of the members of its council. I wish first to express my appreciation of the honour that has been conferred on me by the invitation to address your society—an honour which is enhanced by the fact recognised by all Englishmen that France is ahead of all nations in the science of aeronautics, and that La Societe Francaise de Navigation Aerienne which I am now addressing, may, with sincerity, be called the first Aeronautical Society in the world.

The permanent secretary of our British Aeronautical Society, is, as I think you probably all know, the distinguished Major Baden-Powell of the Scots Guards, the younger brother of the famous defender of Mafeking. He is at present absent with his regiment at the front in South Africa. During his absence I have the privilege of fulfilling his duties.

Our British Aeronautical Society was for many years conducted by the late Mr. Frederick Brearey, who, I have no doubt, was known to some of your council. His chief aim was to develop flying machines, and he invented several working models which I have myself seen fly round a large hall. All models will not do this. I believe these machines were very akin to those invented by M. Penaud. During Mr. Brearey's lifetime, the British Society, though containing several distinguished members, had not been large.

Some time before his death, Mr. Brearey asked me whether, when he gave up the work, I would undertake the honorary secretaryship of the Society in his place; but at that time I did not see my way to undertake so serious a duty. Shortly after Mr. Brearey's death, the council asked Major Baden-Powell to accept the post of honorary secretary, and with the energy which is characteristic of the Baden-Powell family, he rapidly infused new life into the Society, increased the quantity and quality of the members, enlarged the council, and developed the quarterly journal—making it the interesting and useful chronicle of aeronautical matters it now is. Major Baden-Powell is the inventor of the war kite of hexagonal shape, which has not only taken up photographic instruments, but also lifted men to considerable elevations for observation purposes.

Before I pass on to say a few words about the other members of our council, I will say a few words concerning Major Baden-Powell's war kites, and of the use of balloons in the South Africa war. The principal use to which Major Baden-Powell has applied his kites in this war has been in connection with M. Marconi's wireless telegraphy. There were no poles long enough to be of any use, but Major Baden-Powell came to the rescue with his kites, and the apparatus was successfully reared to the necessary height in the air, and messages transmitted for a great distance—in some cases 85 miles. He also applied his kites on Modder River to the taking of photographs at great heights of camps, tents, guns, etc.

Several completely equipped balloon parks have been despatched by our Government to the seat of war in South Africa, both in the eastern and western arenas, and the captive observation balloons have proved of the utmost value throughout the campaign. Their manipulation was under the direction of various officers, Capt. Jones, R.E., and others, trained by Colonel Templer, a distinguished member of our council, and who is the instructor in ballooning to the British Army, which means that every officer in the army who is destined for the balloon service is trained by this expert and intrepid aeronaut.

This distinguished member of our council is also at the front. He is not only in charge of the balloon equipment, but he has had a

special command entrusted to him as superintendent of the military transport traction engines and waggons. He was shipwrecked on the way out with all his horses and engines, but finally arrived safely.

The British war balloon is made of goldbeaters' skin, a substance admirably suited for the purpose, on account of its lightness and capacity of retaining the hydrogen, the desideratum of strength being obtained by a special process of which our balloon engineers are very proud. The gas for inflating the balloons is invariably compressed in steel cylinders and carried to the place of operation. During the siege of Ladysmith, the captive balloons were invaluable, the observers in the car locating the enemy's guns and directing the fire of the British artillery by telegraphing the observations to those below. At Maggersfontein the aeronauts did good service, and in one of General Buller's attempts to relieve Ladysmith, the eagle eye of the balloon saved our troops from marching into a death trap at Spion Kop. On one occasion a shell went through a balloon, and owing to the rents made, the balloon descended gradually to the ground without injuring the aeronauts. A day or two afterwards, the balloon again ascended, two patches showing that it had been a target for the fire of the enemy. The usefulness of the balloon in South Africa will have silenced for ever the criticisms of those who have disregarded its value in warfare, and grudged the national expenditure on the service of the air.

In speaking of the balloon equipment of the British Army, I may just mention that it has been my privilege to invent the system of electric balloon signalling, which I have supplied to the British Government, and also, I may add, to the Belgian and Italian Governments. This system will be shortly on view in Group XVIII. of the Paris Exhibition.

It is worthy of note that the Government are now establishing a balloon manufactory at Cape Town, which is an official recognition of the service the balloon has rendered during this war. Before I leave the subject of the war, I may mention that there is one other member of the council serving there. Lieut.-General Charles Warren. He successfully conducted a former war in Bechuanaland, and has just been appointed Governor of Griqualand West.

Time obliges me to mention, but very shortly, the other members of the council. Sir Edwin Arnold is an Indian authority and a poet, the author of the "Light of Asia." Mr. Barry is an indefatigable member of our council. Lord Crawford and Balcarres, a Fellow of the Royal Society, takes a wide interest in various sciences, and has been a President of the Royal Photographic Society. Sir William Crookes, also a Fellow of the Royal Society, is of world-wide renown. From his splendid researches have sprung the radiometer and the high vaccua tubes, the necessaria of the Rontgen radiation. Dr. Leslie Earle is an eminent physician, one of our most regular attendants at council meetings. Professor Fitzgerald, also a Fellow of the Royal Society, is a Professor of Trinity College, Dublin, Ireland, and is an authority on the Soaring Flight of Birds. Mr. Frost is a Justice of the Peace, and has specially given his attention to the development of flying machines. Major Fullerton, Royal Engineers, holds a high command in the Channel Islands. Mr. Glaisher, a Fellow of the Royal Society, an honorary member of our Society, is so well known for his scientific ballooning, and his famous ascent of seven miles, that I need hardly dwell longer on his work before such an audience of aeronautical experts. Mr. Hiram Maxim is the inventor of the Maxim gun which has been so much used throughout the South African war. He is also the inventor of the great flying machine on the aeroplane principle, which bears his name. Though he has not yet allowed his machines to fly off the rails upon which it has made several successful journeys, it is the opinion of some British experts that it is the most advanced flying machine yet designed, and would fly, if Mr. Maxim thought fit to let it do so. But the light engine and boiler has cost Mr. Maxim an enormous sum, and he doubtless has good reasons for delaying his final experiment. Major H. C. Roberts is another energetic and zealous member of our council, of long connection with the Society, and he has laboured for its development and wellbeing. On most occasions he takes the chair at our council meetings.

Amongst the names of our ordinary members who have made high and interesting balloon ascents lately, I should like to mention the names of the Rev. J. M. Bacon and Mr. Percival Spencer, of whose journeys you have doubtlessly read.

I should also mention the names of three members of our Society whom we have lately lost. The lamented Mr. Coxwell, the intrepid aeronaut who guided Mr. Glaisher in his high ascent; Mr. Pilcher, the inventor of the soaring machine which bears his name, in which he met his death, and which our Society is now exhibiting at the Crystal Palace, Sydenham; Colonel Elsdale, who, with Lieut-Col.

Templer, worked out for the British Government our goldbeaters' skin war balloon. I must also make mention to you of the death of the Duke of Argyle. He was formerly a member of our Society, and in days long past, meetings of the Society used to take place at his house on Campden Hill, Kensington. He was a man of many parts, eminent as politician, orator, litterateur, historian, geologist, and student of flight. He held numerous high posts in Great Britain, and reaped high honours. He was a Scotsman—a Highland chief—of that land of the mountain, gorge and flood, to which I am also proud to belong.

I hope these few hastily compiled details of our Society and members may have interested you a little in our endeavours. It is my most earnest wish to promote a warm and lasting friendship between La Societe Francaise de Navigation Aerienne of Paris and the Aeronautical Society of Great Britain. I know this will be to the advantage of the British Aeronautical Society, for I speak the heart of every British aeronaut when I say that when he comes to Paris he comes to learn. I feel strengthened in my desire, and encouraged in my efforts by the courteous consent of your President, M. De Fonvielle, to come to London to address our Society, towards the end of the year. I have, while I have been in Paris, heard from your courteous and hospitable Secretary, M. Triboulet, some details of the great Aeronautical Congress you are organising in connection with the Exhibition; and on my return to England it will be my privilege to make them known to our members, and to urge those who can, to take part in both the Congress and the balloon contests.

Several photographs in illustration of this paper were sent from England at the shortest notice, by Mrs. Baden-Powell, Sir William Crookes, F.R.S., and Mr. Hiram Maxim, and were much appreciated by the meeting.

The Secretary Bird and his Flight.

By Major B. Baden-Powell.

I know of no bird from which lessons in practical flight can be better obtained than from the Secretary bird. As one sees him stalking along with stately gait across the veld in South Africa, he reminds one rather of a very large pied pheasant, but with longer legs and an eagle-like head. But now let us gallop straight towards him and note carefully his successive actions. At first, he raises his head in a proud and offended manner, but then recognising the undoubted physical superiority of the mounted man, he hurries his steps and runs in an ungainly fashion, almost as if afraid. Then he slowly opens and extends his great wings till they are widely stretched outwards. His appearance then irresistably recalls to mind with grim sadness the scene, so impressed on my memory, of poor Pilcher's last attempts to solve the mysteries of flight. So this great bird runs for quite a distance, occasionally lurching slightly to one side or the other and gradually getting a hold on the air, so that it is plainly noticeable that his feet touch the ground more and more lightly, and his strides become longer. Then does he slowly but powerfully begin some great beats with his huge wings, the extremities of the feathers of which, singled out like the fingers of an outstretched hand, are turned upwards by the pressure of air. And now the transition 'twixt running and flying is reached. The toes, still violently worked, scarcely touch the ground, giving a mere scratch to assist the propulsion, and then the bird is fairly launched in mid air, when he usually at once rests from his evident exertions, and soars along quietly on outstretched wings. Often he will only go a few hundred yards thus, then dropping his legs to their full length he will gradually and cautiously sink earthwards, repeating his process of running so soon as the tips of his toes can reach mother earth, but not closing his wings until his speed is reduced.

On Forms of Surfaces Impelled through Air and their Effects in Sustaining Weights.

By F. H. Wenham, C.E.,

Honorary Member of the Aeronautical Society of Great Britain and of the Boston Aeronautical Society, Mass. U.S.A.

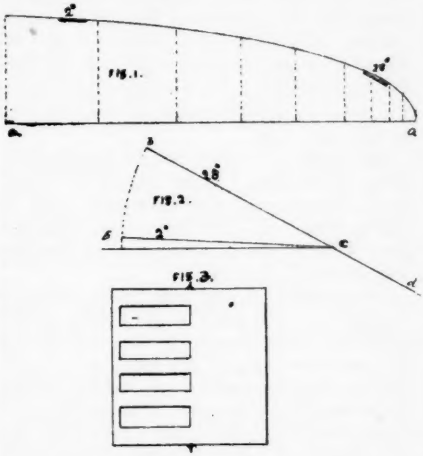
At the first meeting of the Aeronautical Society of Great Britain in June, 1866, the author read a paper "On Aerial Locomotion and the Laws by which Heavy Bodies impelled through Air are Sustained." Since that date, the writer has only occasionally reverted to the subject, but has never been convinced that flight is impossible for man, considering the apparent ease with which large birds traverse the air.

The power required to maintain the flight of the screw vanes mentioned in the paper (now

extensively used for flying-shot practice), was estimated at the rate of three-horse power for each hundred pounds raised. This is widely in excess of the reality, because when the first force that causes ascension is exhausted, the instrument in its subsequent descent, acts as a mere dirigible parachute. This is a most extravagant means of absorbing power. For example, a man weighing 150 lbs. attached to a parachute having this number of square feet, descending 1,300 feet per minute, will be expending six-horse power on the yielding air. This does not give us any knowledge of the power required for bird flight; neither is this to be arrived at by the recent gliding flights of man, for when the first impulse of rising—say against the wind—is expended, the rest of the traverse is performed at the expense of the power derived from the fall, with the waste pertaining to a parachute descent.

The superposed system of "aeroplanes" suggested by the author, involved no new principle. These planes were combined merely for the purpose of strength and lightness of construction, and in the case of a man-carrying machine to avoid an impracticable *length* of wing necessary for his support in rapid flight. The author made three of these full-sized "aeroplane" systems somewhat differing in construction, each on a scale sufficient to carry a man, but they were all so unstable or deficient in equilibrium that to attempt a flight by launching off from an altitude would to a certainty have caused an immediate accident, as will be shown presently. These narrow "aeroplanes" must not be superposed too numerously—not more than three should be used to shorten an impracticable length of a single wing to one-third. Another fallacy, still almost universal, is the supposition that a bird gains support by flying or soaring "against the wind." In free flight there is no such condition as "with the wind, or against it." After the first impulse given at starting, and the momentum from the earth is exhausted, the arrangement is absolutely in the moving body of air, and the force used in flight is alike in all directions, and the speed through the air itself the same. If the creature in flight was blindfold, he could not ascertain in which way he was going relative to the earth.

With a flat surface the air is immediately deflected by the first narrow streak in the front. This deflection is progressively increased by successive portions, till at length effective lift from the after part even of a narrow plane ceases, and for this reason must be a failure in consequence of imperfect support on the entire surface. What direction does the deflected under stratum of air take? It is supposed to be one of parabolic curvature, but this form terminates too abruptly. The author, by means of particles, and wind extended filaments, considers the curve to be a "catenary" or chain curve. With this the pressure recedes from the front edge, and becomes more evenly distributed over the following surface. It might be supposed that the after part loses effect by acting on yielding air. Such would be the case if the surface extended too far back, out of due proportion. The flat plane has to be set at a higher angle to get support on an average of errors. Give the surface the proper curvature, and what is the consequence? The front or entering angle is directly lowered because the pressure is carried backwards, and more evenly distributed over



the surface, and as the front has then less rise, this greatly reduces the "drift" or force required for propulsion. There is, perhaps, another condition. Though the under stratum of air takes the curve of the lower surface, does it do so above it? Probably not, but persists in a straight course; in this case there would be a partial vacuum over the after part of the wing, which would assist the lifting effect.

In cases where every ounce of effort needs to be economised, it is desirable to ascertain what portion of the catenarian curve is suitable for any sustaining surface required. Fig. 1, will demonstrate this: a.a represents the extent of a catenary Fig 2, b c.; the entering angle of 2°, b d, the leaving or terminal angle of 28°. These are assumed. Short lengths of these angles are adapted as chords to the curve, as in Fig 1, keeping the bases parallel; the inter-

mediate portion of the curve is scaled up by offsets from the base-line, in proportion to the size of the surface required.

In all that the author has written on the subject, no allusion has been made as to the application of a motor to a flying machine, because he has not been able to see the practicability of any known arrangement to which it could be adapted with a prospect of success. The idea for the next step has been, that a gliding machine capable of carrying a man should be so far perfected as to obtain the longest flight possible, derived from the force of the first impulse, and then by his own efforts ascertain how much farther he could extend his flight by his continuous exertion in working reciprocating propellers or rotating screw-vanes. Probably we should have arrived at this at an early date, if fatal accidents had not happened to experimenters, who had in practice entered the threshold of probable success. We should then have acquired some data for forecasting possibilities, for we are still ignorant of the power required to propel any machine quite suitable for flight.

Mathematical research and calculations have gone for nothing. In no branch of science have discrepancies and differences been so widely erroneous. The author has, therefore, been diffident about attempting to elucidate the subject by figures.

Occasionally, during high gales, some attempts have been made by the writer to gain additional knowledge by various models, but the capricious force of the wind, and its ever varying direction, baffled any definite results. Therefore, for the purpose of obtaining a perfectly steady current of air, a fan-blower has been employed. It may be remarked that the same condition of relative force exists through the air, if either the body is rushing through air, or the air against the body at a similar speed, and in this case we have the experiments upon stationary models under direct observation.

The blower is nine inches diameter at the fans, and makes 1,700 revolutions per minute, as driven by a foot-wheel and treadle. The exit orifice is 1¼ in. by 3 in., and the speed of the air issuing at the end of a guide trunk to ensure parallelism was at the rate of 25 miles per hour. This current required all the strength that could be exerted. The speed of this was measured by a Lind anemometer held in the blast, and verified by the direct force upon a plane surface. The models were held by two narrow spring clips at the sides, which could be adjusted at any angle. The axes of the clips were passed through the ends of two long arms at each side of the blower-case, to which they were pivotted. The short lengths of the arms at the back were connected by a shelf, upon which counterweights were placed, exactly to balance any models placed in front; these were limited in size to three inches square, in order to be within the column of issuing air. The weights for indicating the "lift" were not set upon or attached to the models, as this would have interfered with results, but were placed upon one of the side arms, in a cap in a line with the axes of the clips.

This same arrangement will not serve for measuring the forward resistance or "drift." This was effected by a vertical swing-arm, having similar adjustable clips and axes, central within the column of air from the nozzle of the blower. From a right angle arm, half the length of the vertical one, a scale pan was suspended, in which the weights were placed, which, of course, had to be estimated at half. It is not pretended that these results obtained could be strictly accurate, by reason of the small size of the surfaces experimented with. The blower should be at least eight or ten feet in diameter, driven by a 20 h.p. steam engine, or more.

The experiments were first tried with stiff cardboard, but as this appeared to be somewhat deflected by the vexatious lift, occurring mostly at the front edge, tinplate was substituted for the models.

Description of Models.	Angle or Rise.	Grains Lift.	Grains Drift.
1. Flat plane, three inches square..	6°	60	40
2. „ with spar above in front $\frac{1}{10}$ in. thick	6	60	45
3. „ circle, three inches diameter	6	60	30
4. „ „ with half area in centre cut out	6	60	45
5. Nine superposed bands slightly concave, arranged backwards in steps within a square of three inches	—	420	240
6. Three inches square, curved, entering angle 2½°, terminal angle 30°	—	360	45
7. Three inches square, curved, entering angle 2°, terminal angle 28°	—	330	42

Remarks.

No. 2 shows that a spar or thickness over the front edge does not interfere with the lift, but much increases the drift. We may, therefore, infer that this, although a necessity in aerial machines, should be as thin as consistent with strength.

No. 3 shows that a circle has the same "lift," but less drift than a square of the same diameter.

No. 4. With a circular orifice having half the area of the circle cut out, the lift was not materially altered, but the drift is considerably increased. This confirms an experiment tried by the writer, with a plain circular kite in which the half area was afterwards cut out, with apparent equal efficiency termed a "ring kite."

No. 5. The same arrangement of superposed surfaces, proposed by the author, in the first issue of the Aeronautical Society in June, 1866, but with this difference, that the receding step-like arrangement would tend to prevent interference from each other with less distance in height. The lift of the arrangement is very great, and so is the drift, arising from too many edge resistances, which make the form too unwieldly to be of much use.

With Nos. 6 and 7 the results were very remarkable. So to term it, there was a degree of life and energy in this form of surface that the flat did not possess. On this point further remarks will follow.

A curious experiment was tried. A three-inch square was balanced on pivots as shown in Fig. 3, with half the area of one side cut away in four openings, leaving five narrow ribs, the open side was weighted, to compensate for the loss of material. On holding this in the blast, with the pivots vertical, the blank side having greater area, was driven back, the form taking an angle of about 65°. As the axis was brought towards the horizontal, till nearly parallel with the current, the open side rose up above the other, and had a greater lifting force than the close one. This explains a fact, that many persons may have noticed that some rooks at moulting time have lost most of the alternate primary feathers of one wing, so leaving openings; but instead of flying lop-sided, there is apparently no loss of balance, the support of one wing appears to be as good as the other.

The writer has long doubted whether flight can possibly be effected with *flat* aeroplanes. There is no such form in the wings of birds of passage, in which they are invariably concave beneath. Aeroplane or flat surface experiments are always difficult and unsatisfactory, from the lifting force persistently occupying the front edge. The after part of the surface does not assist much, and may be cut away or mutilated without detriment to the result. With flat surfaces we must adopt long planes extending laterally. We know where to begin, but not where to end, for obtaining the best advantage. *The whole secret and success in flight depends upon a proper concave form of the supporting surface.*

For comparison on a large scale if this 360 grains on the model surface of 1-16th of a square foot is increased in proportion 200 times, it will give a lift of more than 1 lb. per square foot. But the power to propel at 25 miles per hour must be estimated as the "drift." This is 45 grains taken at 200 times is equal to 1.56 lbs. at 2,200 feet per minute, equal to 3,432 foot sounds or about 1-11th h.p., or less than the half strength a man is capable of exerting. In this estimate no allowance is made for the resistance of frame work or appendages. The webs of a trial machine might be about three feet wide, in three tiers extending twenty feet from end to end sideways, thus spreading 180 square feet of surface. The great difficulty yet to be overcome is that of equilibrium during flight. More than thirty years ago the writer of this, made a winged model, duly weighted, which skimmed away steadily when launched from a house top; Mr. Glaisher was requested to drop it from the car in his next balloon ascent; he did so, and reported that it descended steadily for some dozen yards, then tripped and whirled over rapidly till it reached earth.

A long tail or expanse of surface aft under the instant control of the aeronaut must be considered as indispensable for the purpose of steering and balancing.

Mr. Hargrave's Paper on Sailing Birds.

To the Editor of the Aeronautical Journal.

Sir,—I hardly think that Lord Rayleigh can have fully understood Mr. Hargrave's contention when he "fully agreed" with Mr. Maxim that the simple lifting up and down of the air by waves could not, without any onward wind, enable a bird to sustain its weight. It is of no consequence to a bird whether the air within which it is flying is or is not accompanied in its motion by the seawater or by neighbouring air, and if any simple upward

draught of air can enable a bird to support its weight, the upward draught accompanying the back of a wave can do so. No doubt the bird must be falling relatively to the air in which it is moving, and from that point of view it might appear, at first sight, as if it must ultimately reach the water below it which is rising at the same rate as the air. This, however, ignores the forward motion of the bird, which is constantly carrying it over a fresh water surface, which, though moving upwards with the same velocity as the last, began at a lower level, and is, consequently, when the bird reaches it at the same level as the one it has just left, while this latter goes on and does reach, at the crest of the wave, a maybe, higher level than the bird.

It is a mere question as to whether the bird, when moving through the air at the same rate as the waves, will, or will not, fall in still air at the rate of the upward draught on the face of a wave. If a bird gliding downwards at a constant velocity in still air goes forward at the rate of the wave and sinks downwards more slowly than the air at the face of the wave is moving upwards, then it could maintain itself in this upward draught.

It might, at first sight, appear as if the question were the same as the problem as to whether a bird could fly over an undulating country when there was no wind, but the forward motion of the waves and consequent variable motion of the air over them makes the problem entirely different. If we could assume that there was no tangential force between the water and the air, and it must be quite small, the problem is essentially the same as that of the motion of an undulating country under still air, or what comes to the same thing the motion of air over an unmoving undulating country, and on every hand, by Lord Rayleigh and all other authorities I know of, it is conceded that a bird *can* use the upward draught of air blowing up a hill to sustain itself in a position fixed relatively to the hill. Now suppose the air to be stopped, and the bird and hill given a velocity equal and opposite to that of the air, and we have exactly Mr. Hargrave's case.

The real problem in the case of the bird is probably much more complicated because the motion of the air near the sea is not merely up and down, but is almost certainly, like that of the water, approximately in circles as the wave passes. The bird consequently has not only vertical, but alternating horizontal draughts to depend on, to enable it to sustain itself, so that I have no doubt Mr. Hargrave is quite right in his observation. The only case in which the bird would be unable to use the waves, would be when the wind was blowing at exactly the same rate as the waves were moving forward; that would be the same as if the bird were trying to fly over an undulating country when no wind was blowing. The case would not, however, be *exactly* the same, because there *is* a tangential action between the water and the air, which in the case of the wind blowing at the same rate as the waves would set up eddies, and prevent the lower air from moving as fast as the upper air, and might, in a variety of ways, make it quite possible for those dexterous utilisers of differences of wind motion, the seabirds, to fly without exertion.

I feel the more interested in this question, because from the time of my first taking an interest in Lilienthal's experiments, I have looked forward to the possibility of human beings utilising the trade winds blowing over the sea as a means of locomotion. The irregularity of most winds renders their utilisation by mankind almost hopeless, but the regularity of the trade winds and of the waves they produce makes their utilisation quite possible.

Yours truly,
GEO. FRAS. FITZGERALD.

Trinity College, Dublin,
16th April, 1900.

Count Zeppelin's Air Ship.

While the AERONAUTICAL JOURNAL is in the press, the news of the first trial of Count Zeppelin's Air Ship has arrived, and it is reported that it has travelled from Lake Constance to Immenstadt, a distance of 35 miles, with safety. Any further comment on this fascinating experiment must be held over until the next number of the Journal, when it is hoped that it will be possible to publish a full and reliable account of the initial, and perhaps subsequent, experiments with the greatest air ship ever launched.

NOTES.

The Duration of the Lifting Power of Balloons.— Up to the present, no very methodical scientific investigations have been carried out to ascertain the time that a balloon of a given size can remain in the air without losing its lifting power; and aeronauts who

contemplate long-distance ascents estimate the lift of the balloon by mere guesswork. It is probable that Monsieur Andrée very much over-estimated the time his balloon would remain in the atmosphere. The balloon is, however, at last beginning to receive the application of scientific methods of enquiry, and a step in the right direction is being made at Berlin, where a joint committee of aeronauts and scientists have collected the means to construct a huge balloon of 318,000 cubic feet capacity. The car of this balloon is 8 feet square and accommodating five persons, sleeping accommodation being provided for three. The principal object of the ascent, which is to take place this summer, is to ascertain the time the balloon will preserve its lifting power, though it is hoped that during the ascent several meteorological and other scientific observations will be taken. It is expected that the journey will last several days, and provisions are to be taken for ten days. The results will certainly be awaited with interest, but the absolute determination of the time a balloon of a given size will remain in the atmosphere must depend very much on the meteorological conditions encountered during the ascent, and would require a prolonged series of observations.

Lady Balloonists.—It is not unlikely that in the future ballooning may become a favourite pastime of ladies. Some, indeed, have already shown signs of an intense thirst to breathe the upper atmosphere. Some years ago, a lady called on the writer of these notes, and asked him if he could give her "lodgings in a balloon," as she wished to ascend every evening. Being an actress on the London Stage, she wished for the stillness of the upper air to recover the nervous exhaustion her public profession exacted. She had also lost her complexion, and thought that nothing would bring it back but the tonic air that is imbibed from a balloon. She had only one fear—that was she suffered from cold feet, and had just a misgiving that the journeys might add to this discomfort. The writer asked her whether she wished to ascend in a free balloon or a captive one, using the word free in its accepted sense in connection with balloons, when she exclaimed "Oh, not in a free one, it would be so crowded." She had an income, and could afford a private one. In the case of this lady, probably enthusiasm was bordering on mental derangement, there are however many examples of ladies of distinguished mental endowment who become aeronauts for the sake of advancing knowledge. In this country, Miss Bacon has won admiration by her courage in sharing the perils of her father's scientific balloon voyages, and has contributed to the usefulness of these expeditions. One of the latest efforts of lady balloonists is that of Miss Klumpke, of the Paris Observatory, who started in a balloon to observe the eclipse of the sun. According to the "Daily Telegraph," Miss Klumpke failed to accomplish the observation she intended to make. It appears she started too late, barely an hour before the commencement of the eclipse, and did not rise sufficiently high above the clouds to be able to make observations of the corona. The elevation reached was only three and a half kilometres, whereas Miss Klumpke has come to the conclusion that balloon observations of solar phenomena will generally require a height of five kilometres. At this altitude, Miss Klumpke thinks that it will be an easy matter to obtain photographs of the sun of great scientific value. But though the main object of these ascents was not realised, yet, it appears, that some valuable meteorological data were obtained. The Duchess d'Uzes is also an ardent balloonist, though in her case, it appears to be the pleasure of the aerial voyage that attracts her, and not scientific investigation. She has lately taken a three hours' trip in a stiff breeze, piloted by M. Mallett. The start was made from Saint Denis, and the landing safely accomplished at Montargis.

The Paris Balloon Races.—According to the "Morning Herald," the recent long distance balloon races has been successfully accomplished. It was won by M. Balsan, in his balloon Saint Louis. The aeronaut had remained 18½ hours in the air without descending. M. Jacques Faure came in second, with 17 hours. This race, however, does not run the record at all close, since M. Castillon St. Victor has still the record of 29 hours.

The Descent of a French Balloon and Kite in England.—One of the French unmanned balloons with self-recording instruments fell on May 9th into a tree on the farm of Mr. Horton, Little Leigh, near Northwich, Cheshire. In the basket containing the recording instruments, letters were found from a French observatory, offering a reward for any person finding and dispatching the instrument to the owners.

Mr. E. Ibbotson recently addressed a letter to the "Standard," describing the fall of a large French kite in a field at Burmarsh, Kent, about a mile and a half from the sea, during the gale of February 10th. The kite was three feet wide and nine feet long, and had about three hundred yards of tail attached to it.

The rector of the parish at once communicated with the owner, and obtained the following information. The kite broke adrift from the grounds of M. Delcourt, Chalet des Vogues, Pas de Calais, at six p.m. on February 10th. A shepherd who was looking after his sheep came to the end of the cord which he picked up and began to wind up; after a long while he arrived at a ditch, in which lay the kite. The cord was lying in a S.W. to N.E. direction, and had been trailed through the sea, and over the telegraph wires which run along the sea coast. The kite was packed and returned to the owners, who not only paid all the expenses incurred, but liberally rewarded the finder.

War Balloons and International Law.—A legal correspondent in the "Standard," recently commented upon the debated question as to whether the war balloonist, when captured, is liable to be court martialled or captured and shot as a spy, or should be treated as a prisoner of war. Germany has been the chief exponent of the sterner view. In the Franco-Prussian War, M. Verrecke and some other balloonists who descended in Bavaria, and were taken captive, were sent to a military prison. M. Nobecourt, made captive under similar circumstances, was condemned to death, although the sentence was afterwards commuted to one of fortress imprisonment. In no case does the extreme sentence appear to have been carried out on a balloonist. The more lenient, and surely reasonable view is represented by Article 22 of the Brussels Declaration of 1874, which provides that "individuals sent in balloons to carry despatches, and generally to keep up communication between the different parts of an army, or of a territory," are equally with military men charged with the duty of penetrating the enemy's lines to collect information, entitled to be treated, on capture, as prisoners of war.

Obituary.

MONSIEUR DAGRON.

"La Nature" informs us of the death of M. Dagron, an aeronaut of the siege of Paris, and the inventor of the microscopic photography. This ingenious process added considerably to the usefulness of the aerial post during the investment of the French capital. The tiny scraps of paper on which the correspondence was photographed, was so exceedingly light, that one pigeon used to carry over fifty thousand messages, which were read off at the post office, by means of an optical projection apparatus. It is a fact that the fifteen hundred thousand messages sent during the siege, could have been carried at once by one bird. M. Dagron was born at Beauvoir, and attained the age of eighty-one. As "La Nature" remarks, his name deserves to be remembered.

Foreign Aeronautical Periodicals.

L'AERONAUTE (Paris).

April.—Séances des 5 Mars. et 5 Avril. Communication par M .F. Roux, "Le Vol des Oiseaux Explique."

May.—Séances des 19 Avril and 3 Mai.—Discours par M. Eric Stuart Bruce.—Communication par M. Grimoin Sanson, ingénieur du Cinéorama à l'Exposition.—Nécrologie.—Madame Vve. Hureau de Villeneuve.

LA FRANCE AERIENNE.

1—15 *April.*—Exposition Universelle de 1900.—Réglement des Concours Nationaux de Colombophilie.—Le présent: C. Jobert.—Aérostation, Exposition Universelle de 1900.—La Colombophilie Algérienne: E. Caillé.—Exposition Annuelle des Avicultures Français: M. Dagour.—Colombophilie Militaire: E. Caillé.

15—30 *April.*—Aeronautique Rétrospective: Docteur Ox.—Combattons La Nature.—Un Progrès en Colombophilie: E Caillé.—Tribune Libre: A propos du Grand Prix de l'Aéro-Club.—Partie Littéraire.—Le Pigeon de Coulmiers.

1—15 *Mai.*—L'Aéronautique au jour le jour.—Pléthore d'Experimentations.—Ballon Dirigeable et Poisson.—A propos du dernier accident survenu aux Ateliers de Meudon: C. Jobert.—La Colombophilie au jour.—Notre élevage en 1900: E. Caillé.

15—31 May.—La Colombophilie au pays des Tzars: Docteur Ox. Le Point d'Appui.—La France Aérienne en Normandie: Réunion Solennelle de la Fédération à Rouen. Revue de Presse Etrangère.—Avril, 1900, Aeronautical Journal.—Mme. C. Jobert.

1 au 15 *Juin.*—Le Vent.—Comte Jules Carelli.—Une Fête in time.—La France Aérienne à l'Etranger.

L'AEROPHILE (Paris).

April.—Portraits d'Aéronautes Contem-

poraines: Comte Jules Carelli (Wilfrid de Fonvielle); Petite Expérience de Ballon Dirigeable (Comte Straus); L'Aérostation et la Comte Portale illustrée (Emile Straus); Commission Aéronautique Internationale (A. Nicolleau); Etudes sur l'Electricite Atmospherique (A. Cléry).

ILLUSTRIRTE AERONAUTISCHE MITTHEILUNGEN (Strassburg).

Ballon photogrammetrie: K. V. Bassus. Aëronautik.—Verbesserungen au der Ballonzerreissvossichtung: Ernst Hauptmann.—Die Aussichten Leutbarer Ballons: Hauptmann Hermann Hoernes.—Ein neuer Abwurfhaken für Registrirballons: Prof. Dr. H. Hergesell.—Graf von Zeppelin's Luftschiff.—Englische Luftschiffer.—Abtheilungen un Süd Afrikanischen Kriege.—Die Beziehungen Zwischen Meteorologie und Luftschiffahrt. Todtenschaus-Gotelieb Wilhelm Daimler: Henry Coxwell.

Notable Articles.

April 4. *Manchester Guardian.*—"Aerial Locomotion." Lecture by Mr. HENRY WILDE.

6. *Public Opinion.*—"Dangers to Balloons."

19. *Sphere.*—"New Form of War Balloon."

May 4. *English Mechanic.*—"The Subjugation of the Air." Letter by E. WILSON.

5. *Golden Penny.*—"Remarkable Flying Machine."

Admiralty and Horse Guards Gazette.—Notice of Article on "Military Ballooning" in the *Militär Wachenblatt.*

11. *Globe.*—"Is Andrée Alive?" Views of Mr. PERCIVAL SPENCER.

May 11. *Westminster Gazette.*—"War Balloons at the Front:" A Talk with Mr. A. B. Delmard.

June 1. *Golden Penny.*—"Dropping from a Balloon."

McClure's Magazine.—"Experiments in Flying." (Illustrated.) By O. CHANUTE.

2. *Pall Mall Gazette.*—"Coming Trial of a Navigable Balloon."

The following List of Applications for Patents connected with Aeronautics has been specially compiled for the *Aeronautical Journal* by Messrs. BROMHEAD & Co., Patent Agents, 33, Cannon Street, London, E.C.:—

Applications for Patents.

(*From 7th March to 30th May*, 1900.)

7,442 of 1899. D. M. BOWYER-SMITH, 20, Piccadilly, London. **Improvements in or Relating to Propelling Means Suitable for Use in Flying Machines.**

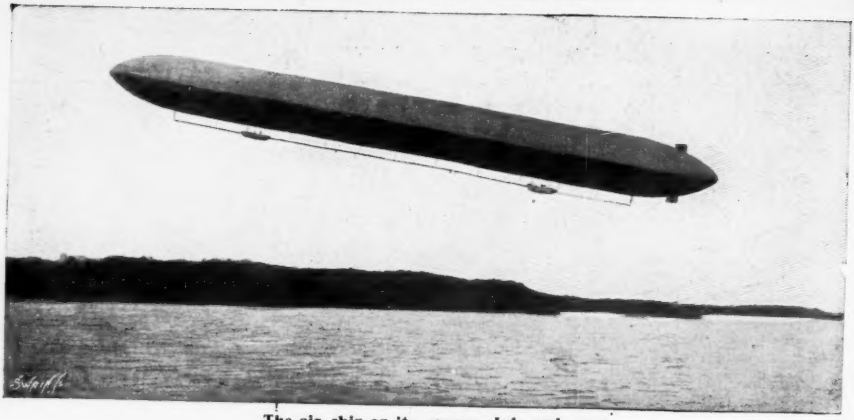
7,635 of 1899. AUGUST RIEDINGER, 23, Eisenhammerstrasse, Augsburg. **Improvements in Captive Balloons.**

14,802 of 1899. G. LOEPER, 27, Metzer Strasse, Berlin. **Improvements in Navigable Balloons.**

24,047 of 1899. A. J. BOULT, 111, Hatton Garden, London. **Improvements in or Relating to Air Ships or Vessels.** (Communicated by Ernst Rudolf Krocker, merchant of Teplitz, Bohemia).

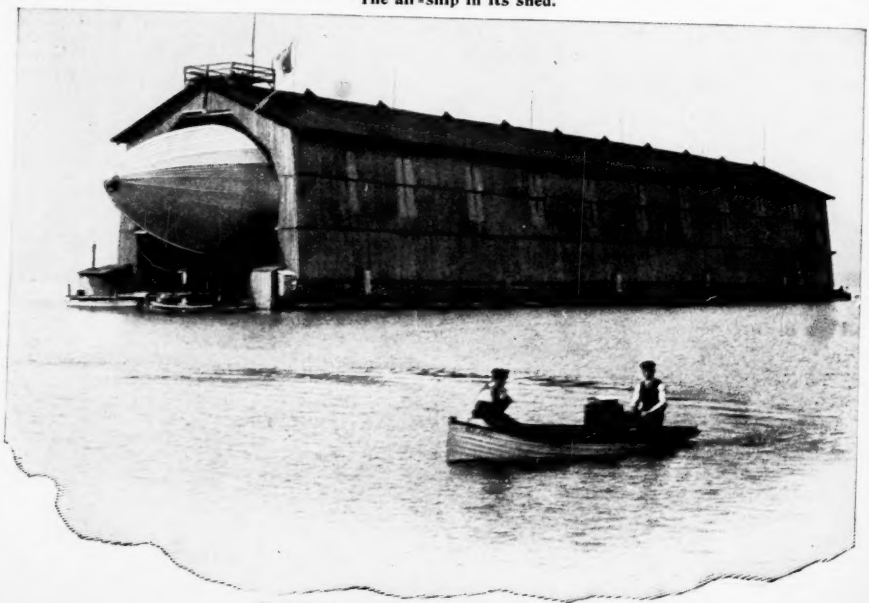
5,092. P. A. ALEXANDER, of the Experimental Works, Bath. **Improvements in or connected with Air Propellers.**

THE ZEPPELIN AIR-SHIP.



The air-ship on its voyage, July 2nd, 1900.

The air-ship in its shed.



The air-ship just emerging from the shed.

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